

# Socioeconomic Disparities in Adult Oral Health in the United States.

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## □ Introduction

Socioeconomic (SES) inequalities in health and health care utilization are receiving increasing attention in current U.S. policy initiatives. But SES inequalities in oral health and the utilization of dental services have not yet been fully integrated into these ongoing initiatives. To stimulate discussion of inequalities in oral health/care in this policy context, the present study describes and evaluates SES disparities in adult oral health using information obtained through the 1988-1994 National Health and Nutrition Examination Survey (NHANES III).

## Background

Previous analyses of NHANES III data on SES disparities have focused both on educational attainment and family economic status variations in oral health. This study extends these earlier analyses by examining relations between SES considered globally and adult oral health.

## Scope

The study focuses on adults 25 years and over, on dentate adults 18 years and over, and (in one instance) on dentate persons 18-74 years of age, in the civilian, noninstitutionalized population of the coterminous United States. Aspects of oral health reflective of unmet needs and access to health care are given primary attention, including edentulism, untreated coronal and root decay, gingivitis, loss of attachment of 4+ millimeters (LOA 4+mm), having one or more restorations or tooth conditions that might benefit from treatment (RTCs) involving pulpal pathology or a retained root, and a dental visit in the past 12 months.

## Objectives

*The purpose of this study was fourfold:*

- 1) to describe SES disparities in adult oral health and in the utilization of dental services;
- 2) to evaluate whether, and to what extent, SES disparities may be independent of the effects of age, gender, and racial-ethnic background;
- 3) to evaluate the lack of a recent dental visit as a source of SES differentials in unmet oral health needs; and
- 4) to evaluate potential two-way interactions between SES and age, gender, race-ethnicity, and a recent dental visit with regard to the aspects of oral health studied.

## □ Methods

**Source of Data:** 1988-1994 National Health and Nutrition Examination Survey (NHANES III)

## Study Populations:

13,040+ persons 25 years and over  
14,290+ dentate persons 18 years and over  
13,370+ dentate persons 18-74 years of age  
Table 1 shows the gender, age and racial-ethnic composition of the two main study populations.

## Measurement

Information on clinical parameters of oral health was obtained through visual-tactile oral examinations conducted in Mobile Examination Centers (MECs) by licensed dentists who were trained and calibrated to use standardized criteria in field studies.

Information on individual educational attainment, annual family income, age, gender, racial-ethnic background, and a recent dental visit was obtained through family and personal interviews taken a week or two prior to the sample person's oral examination. SES was measured by a composite index (see Figure 1--attached) based on individual educational attainment and family economic status (as indicated by the ratio of annual family income to the official poverty threshold). This index was grouped into four approximately equal categories describing persons with lower, lower middle, upper middle, and higher SES index scores.

SES disparities in the prevalence of each oral health characteristic studied were quantified by the ratio between the odds for persons in each of three lower SES score categories and the odds for persons with higher SES scores. Particular attention was given to the ratios between the odds for the lowest and highest SES categories. In most instances, this approach captures the largest SES disparity for a given indicator (*see below under RESULTS*).

## Variables Used in Analyses & Their Definitions

- **Edentulous status:** Person has no natural teeth.
- **Untreated coronal decay:** Person has one or more coronal tooth surfaces with untreated decay.
- **Untreated root decay:** Person has one or more root tooth surfaces with untreated decay.
- **Gingivitis:** Person has one or more gingival bleeding sites.
- **Loss of attachment of 4+mm:** Person has one or more sites with LOA of 4+mm.

- **Any tooth condition involving pulpal pathology or a retained root:** Person has one or more RTCs involving pulpal pathology or a retained root.
- **Recent dental visit:** Person reported visiting a dentist or dental hygienist in past 12 months.

#### Data Analysis

- Weighted data.
- SUDAAN software (7.0)--Proc Descript and Proc Logistic.
- Reference cells: Persons with higher SES scores, females, white non-Hispanics, and a dental visit in the past 12 months.
- Satterthwaite adjusted F-statistic used in evaluating two-way interactions and certain pairwise contrasts.
- .01 level of significance used in evaluating statistical results.

#### Results

##### Descriptive

Table 2 (*see attached*) shows descriptive statistics for each aspect of oral health studied.

Table 3 (*see attached*) shows the unadjusted associations between SES and each oral health indicator.

##### Analytic

Among persons 25 years and over, SES disparities in edentulism were conditional on race-ethnicity. The likelihood of edentulism across SES categories also was conditional on age among persons 25 years and over, but not among persons 35 or 45 years and over (*See Table 4--attached*). Accordingly, the effects of SES on edentulism, conditional on race-ethnicity and age, are presented first (*Figures 2 and 3*); followed by a presentation of the effects of SES on the other oral diseases and conditions that were studied (*Figures 4-9--attached*).

#### Summary

Logistic analyses of edentulism among adults 25 years and over (no one between 18-24 years was edentulous) which also controlled for age, gender, and race-ethnicity revealed that the effects of SES were conditional on racial-ethnic background (*Figure 2--attached*) and age (*Figure 3--attached*).

For example, compared to higher SES white non-Hispanics, lower SES black non-Hispanics were 4.8 times more likely to be edentulous, while their lower SES white non-Hispanic counterparts were 10.2 times more likely to be edentulous (*Figure 2--attached*).

The likelihood of edentulism across SES categories was also conditional on age among persons 25 years and over, but not among persons 35 and 45 years and over (*Table 4--attached*). With only two exceptions, among persons 25 years and over, the disparity between lower and higher SES categories with respect to edentulism differed across strata.

Logistic analyses which controlled for age, gender, and race-ethnicity showed that, compared to the reference population of persons with higher SES scores, those with lower SES scores were at least 1.5-2.0 times less healthy ( $p's < .01$ ). This was the case with gingivitis (*Figure 4--attached*) and LOA 4+mm (*Figure 5--attached*).

For other indicators among the dentate, the disparities were 3-4 times greater.

Lower SES scorers were 6.1 times more likely to have untreated coronal decay (*Figure 6--attached*); were 7.2 times more likely to have untreated root decay (*Figure 7--attached*); and were 7.5 times more likely to have a restoration or tooth condition involving pulpal pathology or a retained root that might benefit from treatment (*Figure 8--attached*).

Among dentate adults, lower scorers were 3.8 times less likely to have visited a dentist or dental hygienist in the past 12 months (*Figure 9--attached*).

Throughout the analyses, controlling for a recent dental visit (where pertinent) had little additional

effect on the size of the SES disparities after age, gender and race-ethnicity had been taken into account (*bottom panels of Figures 4-8--attached*).

#### Conclusions

SES disparities in aspects of adult oral health reflective of unmet needs occur across a broad spectrum and are largest for dentate status, dental decay, and extreme tooth conditions.

There also are SES disparities in the recent use of dental services, but these latter differentials do not account for the SES disparities in oral health.

Further analysis of NHANES III data and new research studies are needed to further clarify linkages between SES and oral health, as well as conditional effects of SES on oral health.

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**Figure 1. Construction and Classification of Summated SES Index Scores For Persons 18 Years and Over Based on Individual Educational Attainment and the Ratio of Annual Family Income to the Official Poverty Threshold: United States, 1988-1994**

Individual Educational Attainment	Ratio of Annual Family Income to the Poverty Threshold						
	< .5 (1) <sup>a</sup>	.5 - .9 (2)	1.0– 1.9 (3)	2.0– 2.9 (4)	3.0– 3.9 (5)	4.0– 4.9 (6)	≥ 5.0 (7)
< 8 Years (1) <sup>a</sup>							
8 Years (2)							
9-11 Years (3)							
12 Years (4)							
13-15 Years (5)							
16 Years (6)							
≥17 Years (7)							

Source: NHANES III

<sup>a</sup>Item scores used in summations.

**Table 1. Percent Distribution of Persons 25 Years and Over and of Dentate Persons 18 Years and Over, By Selected Demographic Characteristics According to Socioeconomic Status: United States, 1988-1994**

Demographic Characteristic	Persons 25 Years and Over					Dentate Persons 18 Years and Over				
	All	Socioeconomic Status				All	Socioeconomic Status			
		Lower	Lower Mid.	Upper Mid.	Higher		Lower	Lower Mid.	Upper Mid.	Higher
<b>All Persons</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>
	<i>Percent Distribution</i>									
<b><u>Gender</u></b>										
Men	47.5	43.8	46.2	47.3	50.8	47.9	44.5	46.9	47.3	51.2
Women	52.5	56.2	53.8	52.7	49.2	52.1	55.5	53.1	52.7	48.8
<b><u>Age</u></b>										
18-24 Years	<sup>a</sup>	<sup>a</sup>	<sup>a</sup>	<sup>a</sup>	<sup>a</sup>	15.8	23.3	20.8	13.8	9.3
25-34 Years	26.6	25.3	28.8	29.4	23.4	25.0	25.5	26.6	27.0	22.0
35-44 Years	25.3	18.7	23.5	27.8	28.9	23.4	17.7	20.7	25.4	27.2
45-54 Years	15.9	11.4	13.6	16.3	20.2	13.7	8.8	10.9	14.1	18.4
55-64 years	13.4	14.5	13.4	12.8	13.3	10.2	9.2	9.4	10.0	11.6
65+ Years	18.7	30.1	20.7	13.7	14.2	11.9	15.5	11.7	9.8	11.6
<b><u>Race-Ethnicity</u></b>										
White non-Hispanic	78.0	58.3	75.0	82.8	88.6	75.4	50.0	71.8	81.1	87.9
Black non-Hispanic	10.6	19.0	12.5	8.5	5.5	11.3	21.2	13.8	8.8	5.8
Mexican American	4.3	11.2	4.5	2.3	1.6	5.4	15.1	5.5	2.2	1.9
All Other	7.1	11.5	8.1	6.4	4.2	8.0	13.8	9.0	7.3	4.5

<sup>a</sup> Does not apply.

**Source:** NHANES III.

**Table 2. Percent of (Dentate) Persons 25 (18) Years and Over With Selected Oral Diseases and Conditions, and Standard Error (S.E.) of Percent, By Socioeconomic Status: United States, 1988-1994**

Oral Disease Or Condition	(Dentate) Persons 25 (18) Years of Age and Over				
	All	Socioeconomic Status			
		Lower	Lower Middle	Upper Middle	Higher
		<i>Percent of Persons (S.E. of Percent)</i>			
<u>All Persons 25+ Years</u>					
Completely Edentulous	11.2 (0.6)	24.9 (1.4)	14.5 (0.9)	7.3 (0.8)	3.5 (0.4)
<u>Dentate Persons 18+ Years</u>					
Untreated Coronal Decay	27.9 (1.1)	49.9 (1.3)	35.7 (1.8)	23.0 (1.3)	13.1 (1.0)
Untreated Root Decay	11.0 (0.5)	24.0 (1.3)	14.5 (1.0)	9.7 (0.9)	4.7 (0.5)
Any Gingivitis	52.9 (2.1)	63.4 (2.0)	57.1 (3.0)	50.3 (2.1)	45.7 (2.6)
LOA 4+mm	24.9 (0.8)	33.3 (1.2)	26.6 (1.3)	22.7 (1.2)	20.6 (1.3)
1+ RTCs Involving Pulpal Pathology or a Retained Root*	7.4 (0.5)	17.7 (1.2)	8.7 (0.7)	5.1 (0.8)	2.4 (0.5)
A Dental Visit in the Past 12 Months	54.7 (1.0)	34.6 (1.7)	46.0 (1.5)	58.5 (1.5)	69.8 (1.9)

**Source:** NHANES III.

\*Data shown are for dentate persons 18-74 years of age.

**Table 3. Unadjusted Odds Ratios (Lower, Lower Middle, and Upper Middle Socioeconomic Status [SES] vs. Higher SES), 99-Percent Confidence Intervals (CIs), P-Values, and P-Values for Other Pairwise Comparisons For Selected Oral Diseases and Conditions Among (Dentate) Persons 25 (18) Years and Over: United States, 1988-1994**

Oral Disease Or Condition	Odds Ratios Between Three Lower SES Categories & Higher SES			Other Pairwise Comparisons		
	Lower	Lower Middle	Upper Middle	Lower vs. Lower Middle	Lower vs. Upper Middle	Lower Mid. vs. Upper Mid.
	<i>Unadjusted Odds Ratios 99-Percent CIs P-Values</i>			<i>P-Values</i>		
<b><u>All Persons 25+ Years</u></b>						
Completely Edentulous	7.8 5.8-10.4 .0000	4.1 2.8-6.0 .0000	2.1 1.5-2.8 .0000	.0000	.0000	.0000
<b><u>Dentate Persons 18+ Years</u></b>						
Untreated Coronal Decay	6.6 5.1-8.6 .0000	3.7 2.9-4.6 .0000	2.0 1.5-2.6 .0000	.0000	.0000	.0000
Untreated Root Decay	6.4 4.4-9.3 .0000	3.4 2.6-4.6 .0000	2.2 1.5-3.2 .0000	.0000	.0000	.0016
Any Gingivitis	2.1 1.6-2.5 .0000	1.4 1.2-1.7 .0000	1.1 0.9-1.5 .2199	.0196	.0000	.0036
Any LOA 4+mm	1.9 1.5-2.5 .0000	1.4 1.2-1.7 .0000	1.1 0.9-1.5 .2199	.0001	.0000	.0137
1+ RTCs Involving Pulpal Pathology or a Retained Root*	8.7 4.9-15.5 .0000	3.9 2.4-6.3 .0000	2.2 1.2-4.1 .0018	.0000	.0000	.0018
A Dental Visit in the Past 12 Months	4.3 <sup>a</sup> 3.2-5.9 .0000	2.7 <sup>a</sup> 2.0-2.7 .0000	1.6 <sup>a</sup> 1.2-2.1 .0000	.0000	.0000	.0000

**Source:** NHANES III.

\* Data shown are for dentate persons 18-74 years of age.

<sup>a</sup> ORs and CIs shown are reflected. Actual ORs (CIs) were, respectively .23 (.17-.31), .37 (.27-.49), and .61 (.48-.78).

**Table 4. P-Value for Satterthwaite-Adjusted F-Statistic Used to Evaluate Potential Two-Way Interactions Between Socioeconomic Status (SES) and Selected Characteristics Regarding the Likelihood of Certain Oral Diseases and Conditions Among (Dentate) Persons (18) Years and Over: United States, 1988-1994**

Oral Disease Or Condition	Test of Potential Interaction Between SES and:			
	Race-Ethnicity	Gender	Age	Dental Visit in Past 12 Mos.
	<i>P-Value</i>			
<b><u>Persons 25+ Years</u></b> Completely Edentulous	.0070	.503	.00002	_____ <sup>a</sup>
<b><u>Persons 35+ Years</u></b> Completely Edentulous	.0044	.447	.3318	_____ <sup>a</sup>
<b><u>Persons 45+ Years</u></b> Completely Edentulous	.0106	.502	.6142	_____ <sup>a</sup>
<b><u>Dentate Persons 18+ Years</u></b> Untreated Coronal Decay	.279	.330	.025	.207
Untreated Root Decay	.281	.226	.055	.434
Any Gingivitis	.381	.103	.071	.875
Any LOA 4+mm	.335	.089	.145	.157
1+ RTCs Involving Pulpal Pathology or a Retained Root*	.213	.041	.504	.251
A Dental Visit in the Past 12 Months	.086	.105	.273	_____ <sup>a</sup>
<b>Source:</b> NHANES III. *Data shown are for dentate persons 18-74 years of age. <sup>a</sup> Not evaluated.				

<b>Q. Is the Disparity Between Lower and Higher SES Categories With Respect to Edentulism Different Across Age Strata?</b>			
<b>A. In General, “Yes,” But There Are Two Notable Exceptions.</b>			
Two Age Strata Compared	Lower vs. Higher Percentage Point Difference in Edentulism For Each Pair of Age Groups Compared		P-Value for Comparison of Difference for Younger & Older Age Groups
	Younger	Older	
25-34 vs. 35-44	1.5	3.7	.00021
25-34 vs. 45-54	1.5	21.2	.00000
25-34 vs. 55-64	1.5	30.1	.00000
25-34 vs. 65+	1.5	36.6	.00000
35-44 vs. 45-54	5.7	21.2	.00058
35-44 vs. 55-64	5.7	30.1	.00000
35-44 vs. 65+	5.7	36.6	.00000
45-54 vs. 55-64	21.2	30.1	.08129
45-54 vs. 65+	21.2	36.6	.00204
55-64 vs. 65+	30.1	36.6	.08196
Source: NHANES III.			